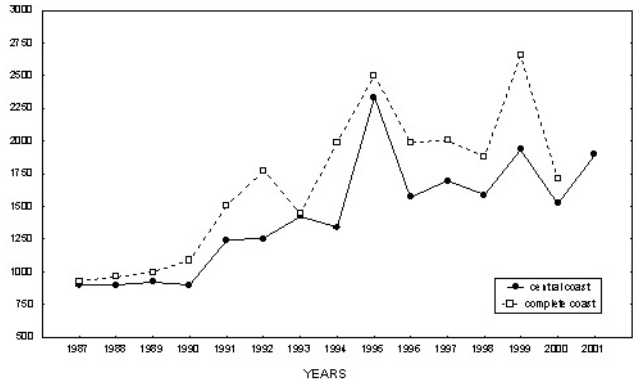

Fig. 2. Annual number of *Caretta caretta* nests.

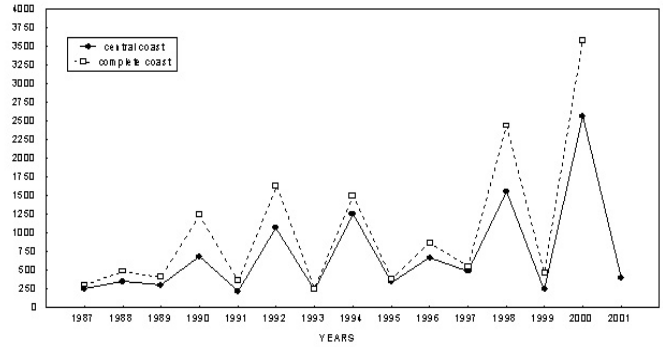

Fig 3. Annual number of *Chelonia mydas* nests.

Status survey of sea turtles and their nesting beaches along the Andhra Pradesh Coast, India

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INTRODUCTION

Five species of sea turtles have been reported from Indian waters, of which four species are known to nest on the mainland coast and offshore islands. These include the leatherback turtle (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), green turtle (*Chelonia mydas*) and the olive ridley (*Lepidochelys olivacea*) (Kar and Bhaskar 1982). All these species, barring the loggerhead, have been reported from Andhra coast (Dutt 1976,1979, Kar 1983, Biswas 1982, Bhaskar 1983) but nesting of only olive ridley sea turtles has been confirmed (Kar 1983). Since the southernmost olive ridley rookery of Orissa (Rushikulya) is close to Andhra Pradesh border, it is possible that the Andhra coast may have significant nesting beaches for olive ridley turtles. While sporadic nesting is known to occur all along the Andhra coast, large nesting aggregations have been reported at a few sites along the northern Andhra coast (Priyadarshini 1998, Subba Rao et al. 1987, Raja Sekhar 2000). However, there is little information on the size, density or seasonality of these aggregations. Some information is available on sea turtle nesting along the northern Andhra coast, but there is currently no information on the status of sea turtles along the rest of the coast. In this context, an extensive survey of the Andhra coast was conducted to obtain detailed information on the status of sea turtles and their nesting habitats.

METHODS

Study area. Andhra Pradesh is located along the East Coast of India and is one of the largest maritime state of India with a coastline of 980 km (13º34.42'N and 80º16.03'E - 19º06.55'N and 84º47.19'E) (Fig. 1). The major rivers joining the Bay of Bengal are Vamsadhara, Nagavali, Godavari, Krishna, Pennaru and Swarnamukhi with several smaller rivers, tributaries, backwaters and lagoons. The Andhra coast also has good patches of mangroves in the Godavari and Krishna deltaic system. However the most dominate coastal vegetation along the rest of the coast are Palmyra and Casuarina plantations on the beach. It has a continental shelf area of 31,000-sq. km. with an annual fish production of 1,50,000 t. Andhra Pradesh, being the state with the second longest coastline in the country makes a major contribution to fisheries and ranks fifth in India in terms of marine fish production (Alagaraja et al. 1987).

Survey methodology. The entire coast was divided into three zones i.e. A - Northern Andhra coast, B - Central Andhra Pradesh and C - Southern Andhra coast. Each zone was divided into different sectors, based on coastal landmarks such as river mouth, bays, lagoons etc,. The survey was conducted in three phases namely pre-nesting survey, offshore survey and nesting/post nesting survey. An interview-based survey was conducted from May 2000 to September 2000 to collect secondary level of information from different sources. A standard questionnaire as suggested by Schroeder and Murphy (1999) was followed for these surveys. The offshore survey was conducted on board with a trawling vessel "Matsya Darshani" of Fishery Survey of India from November to December 2000 and the nesting survey was conducted from January to March 2001. Dead turtles washed ashore along the coast were also enumerated.

RESULTS

Pre-nesting survey. The interview results indicates that the olive ridley is the predominant turtle found all along the coast but no conservation effort has been initiated by any Forest, Fisheries organizations along the coast. It was also found that fish traders rarely sell turtle eggs in the market and meat trade is low but medicine is still extracted from sea turtle liver and bile in a few coastal villages. The fisherfolk identify the breeding and nesting seasons of ridleys as being between November and March in relation to local festivals.

Offshore survey. Sea turtle sightings were significant off the Northern Andhra Pradesh coast. During the experimental trawling (11/2 hr trawling effort each time for 60 trawl) a total of 30 and 32 olive ridley turtles were caught of which 97% were male in November and 98% females in December. The number of captures was more between Visakhapatnam and Kalingapatnam coast.

Nesting survey. Of the various nesting beaches of Andhra Pradesh, the Kapaskudi (Bahuda river mouth), Kalingapatnam (Vamsadhara and Nagavali river mouth), Sacramento (Goutami river mouth), Yellachitladibba (Krishna river mouth) and Sriharikota island (Pulicat mouth) had significant nesting intensity

while in the rest of the beaches, nesting was sporadic to rare (Table 1). The nesting peaked in end January and February along the entire coast. Two green turtles (*Chelonia mydas*) were found dead along the coast during the survey. The number of dead turtles was less in central and southern Andhra Pradesh. During March and April, the mortality declined in all the zones. Almost all the sporadic nests of olive ridleys along the Andhra coast were predated by feral dogs, jackals and hyenas. The highest number of dead turtles was observed between Kalingapatnam and Visakhapatnam. The total number of dead turtles documented along the Andhra coast up to April was 806.

DISCUSSION

Several hundred thousand turtles migrate to Orissa coast to nest each winter at Gahirmatha and other rookeries. These turtles are known to migrate along the Tamil Nadu and Andhra coastlines prior to the nesting season in October and November and again after nesting in May and June (Dash and Kar 1990). Adjacent to the mass nesting beaches of Orissa, the Andhra coast has important sporadic nesting beaches for olive ridley sea turtles. Besides the northern AP coast, high nesting densities were also found along the Krishna and Pulicat beaches in southern Andhra Pradesh. Four river mouths had densities of nesting in excess of 50 / km / season, while densities averaged less than 5 nests / km / season along much of the coast. In conjunction with the fact that all mass nesting beaches in Orissa are at river mouths, it appears that river mouths are preferred nesting habitats for ridleys on the east coast of India. The density of nesting was clearly higher in northern and central Andhra Pradesh than in southern Andhra Pradesh. Ridleys tagged in Orissa have been recorded nesting in Chennai, Tamil Nadu, south of Andhra Pradesh (Pandav 2000). Hence, the possibility of these turtles using suitable beaches in Andhra Pradesh cannot be ruled out. In Orissa, turtles have also been known to use new mass nesting sites (Shanker and Mohanty 1999). This necessitates the need for the development of a dynamic strategy that can protect these turtles throughout their nesting and inter-nesting habitat on the east coast of India. Such a strategy would require high levels of coordination between governmental agencies such as the Forest and Fisheries Departments, Coast Guard and Navy as well as non-governmental agencies and local communities. Such a network requires a good communication network and awareness of the issues amongst all stakeholders.

Some management interventions to reduce fishery related mortality include the declaring No-Fishing zones during the nesting season in areas where sea turtle nesting concentration is high and enforcement of existing laws viz. the Andhra Pradesh marine fishing (Regulation) Rules, 1995. Turtle Excluder Devices would also be effective and is possible by convincing the trawler community about its use. Habitat degradation remains one of the biggest threats on the Andhra coast. Extensive shrimp seed collection along the coast and shrimp hatcheries and prawn farms close to the nesting beach pose a major threat, particularly along the central Andhra coast. Human disturbance and lighting from aquaculture industries was very high along much of the coast and pose a serious threat to turtle nesting habitats (Tripathy et al. 2001). Casuarina and Palmyra plantations close to the beach render the habitat unsuitable for nesting and also provide shelter to egg and hatchling predators, particularly jackals. With the introduction of new jetties and harbors, there will be an increase in fishing craft, gears and fishing operation and which will deter turtles from using the beach for nesting and will lead to larger incidental catch related mortality along the coast. Along with this, the sand mining near Kalingapatnam by Indian Rare Earth Limited (IREL) may also have adverse affect on the nesting beaches. Many major industrial projects are based near the coastal areas. Pollution from sea based industries, urban and military sewage from Visakhapatnam, Kakinada and Suryalanka and sand mining near Kalingapatnam, are likely to have detrimental effects to the coastal environment as well as the sea turtle population and therefore need detailed Environmental Impact Assessments.

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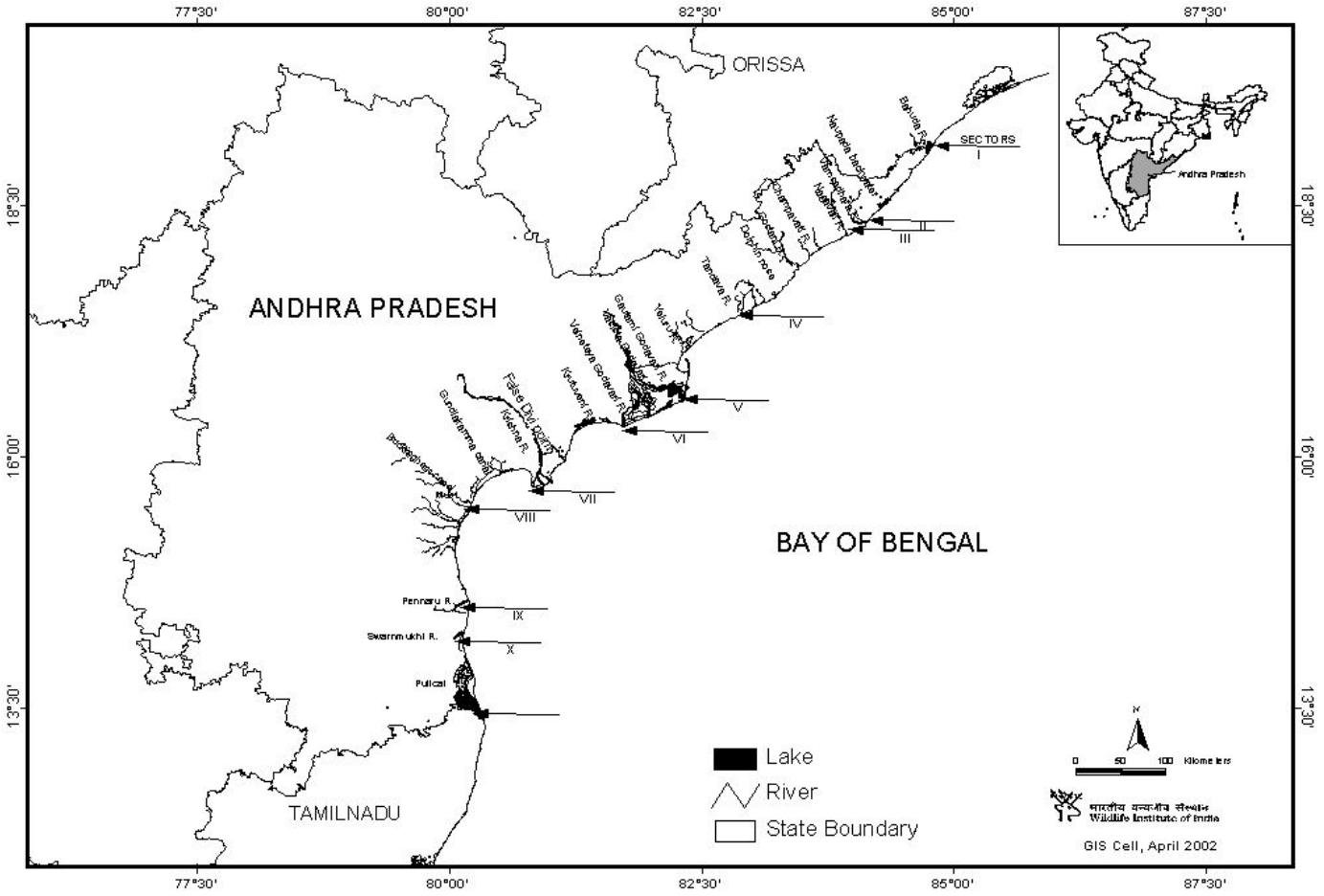

Fig. 1. Map of Andhra Pradesh Coast, India.

Table 1. Nesting of olive ridleys observed in intensified nesting location along the Andhra Coast.

Zone	Sector	Length (km)	Nesting area	No. of nests	Nests /km
A	I	10	Bahuda R – Kapaskudi	550	55
A	II	5	Vamsadhara R - Bandarvanipeta	200	40
B	II	3	Kunduvanipeta – Nagavali R	150	50
B	V	10	Goutami Godavari R - Neelarevu	685	68
C	VII	12	Krishna R – Lankevenidibba	125	10
C	VIII	5	Pennaru R – Mypadu	40	8
C	X	15	Sriharikota – Durgarajapalem	100	7

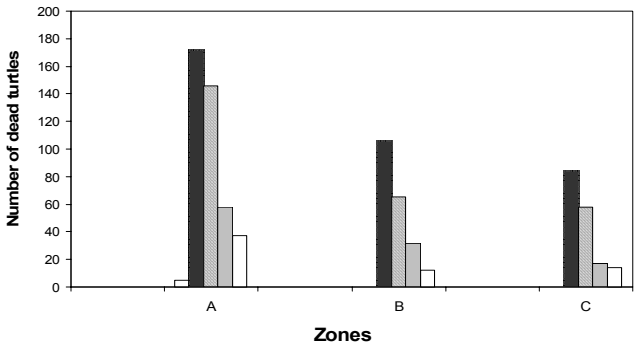

Fig. 2. Dead turtles counted along the Andhra Pradesh coast.